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ABSTRACT

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Investigators influenced by Anglo-American epistemology have frequently mis-interpreted Piaget's genetic constructivism as an empirical psychology, seeing knowledge acquisition as a process in which representations of the world come into increasingly close correspondence with an ontologically unproblematic external reality. Both this interpretation of Piaget, and of ontology, are open to question. First, genetic epistemology seeks to elucidate the epistemic activity through which knowledge is constructed; the particular knowledge-claims empirically elicited are only secondarily relevant. Second, to understand that knowledge is constructed renders problematic the status of the epistemic object, or object-as-known. Structural realism is thus proposed as the appropriate counterpart to Piaget's epistemology, though ambiguities in the theory prevent a definitive choice between interpreting the theory in terms of ontological correspondence or epistemological coherence.

Constructivism and the Epistemic Object

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For those who are sympathetic to Piaget, it is discouraging to see how often his theory is mis-represented in both the philosophical and the psychological literature. Neither philosopher nor psychologist in any simple sense, he was, as he always claimed, a genetic epistemologist. I believe that the failure to come to terms with the distinction between epistemology and psychology - between genetic epistemology and cognitive-developmental psychology - is a continuing source of our difficulty in appropriating Piaget's legacy. This difficulty has at least two sources: first, the tendency among those influenced by the Anglo-American tradition of thought to conceptualize the object of knowledge in a naively realist and static, rather than a constructivist way; and second, ambiguities in the theory itself. In this paper, I will focus on one of these ambiguities, concerning what it is that genetic epistemology tells us about the ontological status of our knowledge.

I

I will begin with the problem of epistemology. As a traditional philosophical question, epistemology has been understood to concern questions of how belief is justified, roughly, "given some belief, on what basis are we entitled to say it is true?" But as epistemology shifts from philosophy to science - as it does with genetic epistemology - the nature of the question changes as well. The "how" of epistemology

now becomes: "given knowledge, how was it constructed?"

And if we ask, "how it is that knowledge is constructed," we further must specify what it is that is doing the constructing. Piaget introduces the convenient fiction of the "epistemic subject" as that component of mental process which performs the act of construction. Clearly, this is not an existing human being, the psychological subject grounded in a world of social relations, of cultural constraints, of affective ties and personal desire, the human being who will through its life acquire one or more wisdoms. Rather, as an idealization of cognitive processes, the epistemic subject is at once singular to each human being as it individually constructs knowledge, and, insofar as genetic epistemology is concerned with the development of knowledge more generally, collective to the community through a centuries-long process of cultural and historical development.

The Piagetian focus on the dialectical interaction of epistemic subject and object-as-known rather than an "object of knowledge," introduces a significant shift in perspective. If the object is known only in interaction with the epistemic subject, then it becomes epistemic as well, an "epistemic object." Briefly, we can say that Piaget charts how the ontological status of the object, far from being transparent, is progressively constructed by the epistemic subject, this construction in turn serving as the occasion through which the subject re-constructs its capacity for effective activity and reflection with respect to the object.

In contrast, Anglo-American epistemology and philosophy of science, even as it has come to acknowledge the role played by background-knowledge and by the community of investigators in the acquisition of knowledge, still favors a largely positivist conception

of subject-object interaction, with clear separation between the knower and the object to be known. In general, the ontological status of the world as "real" is simply pre-supposed as given, and the status of the object is assumed to be unproblematic. I can illustrate this perspective by citing the work of Jerry Fodor, who I single out for his anti-Piagetian claims that the process of concept formation is innate and maturational, not constructive.

Fodor (1985) argues that what he calls the Representational Theory of Mind "purports to explain how there could be states that have the semantical and causal properties that propositional attitudes are commonsensically supposed to have," and that "someone is a Realist about propositional attitudes <if and only if> (a) he holds that there are mental states whose occurrences and interactions cause behaviour" and "these same causally efficacious mental states are also semantically evaluable." (p. 78) In other words, "realism" refers exclusively to the status of the knower; mental processes are taken to be "real", and not epiphenomenal, because they can be said to "really" cause behavior. But a constructivist perspective finds that Fodor's epistemology is too singularly linguistic and conscious to be useful. In this conception, not only is the external world taken as non-problematically given, but efficacious human activity becomes explicable solely insofar as it can be propositionally formulated. All of embodiment, of skill, of unconscious and tacit behavior, of the role of social relations, of the application of knowledge to action, of action itself as a basis of knowledge, of the process of construction - all of this is simply presupposed (cf. Campbell & Bickhard, 1987; Molenaar, 1986).

It is not surprising that Fodor (Piattelli-Palmarini, 1980) concludes that the increasingly powerful capabilities of logical

analysis associated with Piagetian stage transitions should be incoherent. Understood as a problem in the development of propositional logics, Fodor is correct; a weaker logic cannot generate a stronger one. But since it is through reflective abstraction on one's activity, not through propositional logic, that human reason is empowered, Fodor's critique loses much of its sting. One should not conclude that because epistemic activity <u>can</u> be formalized as a logic that it <u>must</u> be.

The confusion engendered by the failure to see cognitive behaviors as moments in a process rather than propositional manipulations can be illustrated by looking at the work of Sophie Haroutunian. Haroutunian critiques Piaget's equilibration model by maintaining as a postulate deemed so transparent as to require no justification, that "One may express the principle of equilibrium with the following function:

$$(x)\ (x \text{ changes from } b_1 \text{ to } b_2 \text{ if } E_1 \text{ changes to } E_2)"$$

where "if environment E_1 is changed to E_2, then x will change its behavior from b_1 to b_2 so as to maintain itself." (Haroutunian, 1983, p. 2) That is, the behavior of the system is taken to be a function of the behavior of the environment. Thus, the epistemic activity attributed to the subject consists of the mental manipulation of propositions characteristic of Fodor's representational theory of mind.

However, from a Piagetian vantage, her argument is exactly backwards in two basic ways. First, she gives epistemological primacy to the environment and, second, she presupposes that mental reflection occurs independently of, rather than interactively with, activity in the environment. It is entirely possible that a system may not respond to changes in the environment that exist from the perspective of an ideal observer, and conversely, that it may change its behavior in response to perceived changes in the environment that do <u>not</u> exist from the

perspective of an ideal observer. That an organism will respond to changes in its environment cannot be pre-supposed; it is precisely how the organism constructs its understanding of the environment - how it determines whether to respond or not, and if so, how - that is in question. The Piagetian argument is that the conception of, and response to, the environment is a function of the epistemic activity of the system, not vice-versa. And Haroutunian's failure to see this leads her to a disturbingly incorrect categorization of Piaget's theory as an instance of a representational theory of mind.

Misreadings like these, typical of philosophers trained in the Anglo-American tradition, are matched by those of psychologists similarly trained, who tend to interpret Piaget's theory as an empirical psychology. Its most salient features, such as the stages of cognitive development or the process of equilibration, are then taken as empirical claims to be corroborated or falsified. If the epistemic object is presupposed as given - for instance, the amount of clay under transformations of shape in conservation inquiries, or the relation of weight and distance from the fulcrum in balance-beam tasks - then the question shifts from the epistemological query of how the child constructs his knowledge to the empirical one of whether or not the child displays the particular cognitive behavior taken as definitional for the stage or activity in question. It is not uncommon to read in the literature that children do or do not display particular behaviors at times allegedly appropriate or inappropriate for them to do so. But these results, interesting in their own right, are only marginally relevant to Piagetian epistemology since they separate the notion of stage from that of construction. Piaget observed in 1955 that

> One tries to construct stages because this is an <u>indispensable instrument for the analysis of formative processes.</u> Genetic psychology attempts to envisage the construction of mental functions, and stages are a necessary instrument for the analysis of these formative processes. But I must vigorously insist on the fact that stages do not constitute an aim in their own right. (Piaget, 1977)

The focus of Piaget's thinking was always the dynamics of epistemology; the stage conception was simply a means of provisionally organizing a massive amount of data. "I would compare <stages> to zoological or botanical classification in biology, which is an instrument that must precede analysis." (Piaget, 1977).

To what, then, can we attribute all the attention stages have received? First, many cognitive abilities do seem to possess stagelike properties, with some sort of global qualitative transformation seemingly taking place between the ages of 4 and 6, and again at adolescence. Even if Piaget is wrong in detail, he has helped draw attention to these phenomena. Second, Piaget's earlier work stressed the operation of the functional invariants of assimilation and accommodation, which resulted in closed structures. The properties of these self-regulating wholes was most often conceptualized as a series of stages, each with a global logic. It is possible that this work was needlessly misleading, (though it is interesting to note that theoretical anomalies to which a rigorous stage conception gives rise, such as <u>decalage,</u> can be reformulated in a way that lessens their potential negative impact on the theory. See, for instance, Feldman and Toulmin (1976), or Lou (1986)). Third and most importantly for this paper, the idea of stages and specific cognitive behaviors lend themselves to being thought about in objectivist ways, as apparently

stable, clearly demarcated, and internally consistent phenomena, to be investigated as things-in-themselves. But as already noted, this way of conceiving cognitive activity is fundamentally incorrect, since it separates the cognitive outcome from the activity of its construction.

The continuing emphasis on an objectivist understanding of Piaget is unfortunate given the strong shift in his work in the last fifteen years of his life from structures per se to a more detailed examination of the process of their construction. Among the fruits of this shift are the revised model of equilibration (Piaget, 1985), and the close studies of procedures (Inhelder & Piaget, 1980; Piaget, 1976; Piaget, 1978; Piaget, 1979). Procedures are the real-world behaviors used by subjects to solve problems or achieve goals; through reflective abstraction upon procedures, structures of the epistemic subject are formed. These structures, in turn, are responsible for the feeling of necessity, the reflective self-understanding or grasp of consciousness that accompanies successful activity. And this feeling of necessity in turn undergoes a development of its own (Piaget, 1986). Thus, rather than any simple concept of stage as object, Piaget's theory entails continual construction, in all aspects of cognitive structuring.

II

Let me try to situate this lingering objectivist bias in understanding Piaget by suggesting some more strictly philosophical bearings.

Piaget is usually thought of as a Kantian. Like Kant, Piaget saw that the qualities of experience were phenomena to be explained rather than naively presupposed. What we directly experience is (in Kant's terms) a sensory manifold, or (in Piaget's) cognitive aliments, which in

the instant of their recognition are already unified as 'objects,' 'events,' 'experiences,' etc. Kant sought to understand how such unified experience came about. In the First Critique (1965), he identified a series of necessary, a priori, and unchanging transcendental principles of structuration - the intuitions of space and time, the categories of the understanding, the threefold syntheses of apprehension, recognition, and recall, and the principle of their unification in the transcendental unity of apperception. He also was concerned with how these transcendental vehicles, empty in themselves, could sustain knowledge. Kant thus postulated the existence of "some third thing," the transcendental schemata, at once homogenous with appearances under the sensory manifold, and determination by concepts under the categories. The application of the schemata to the sensory manifold generates concepts; the determination of concepts under the categories of the understanding guarantees the possibility of certain knowledge.

Piaget, briefly, differs from Kant by combining Kant's quest for the foundations of knowledge with an explicitly biological orientation. He thus expanded the Kantian problematic from that of accounting for the possibility of experience through transcendental mechanisms to that of explaining the genesis of these mechanisms themselves. In understanding the development of knowledge from Piaget's perspective, we are concerned with how the knower's interaction with the world leads it to construct such categories as 'object' and 'event', on the one hand, and with how this interaction leads it to re-construct and modify these same cognitive structures, on the other. As Piaget observed some 30 years ago, "It is by adapting to things that thought organizes itself and it is by organizing itself that it structures things". (Piaget, 1963, p.

8)

I think this much of Kant and Piaget is now part of the received wisdom. But contemporary cognitive psychology also considers itself to be Kantian, and I think this accounts in part for the readiness with which Piaget is underestimated. What cognitive science seems to have taken from Kant is the notion of the transcendental schema, re-born as the idea of "mental representation." For instance, George Mandler, among many others (see, for instance, Gardner, 1985; Hayes, 1981), states: "Schemas are abstract representations of environmental regularities...All actions and thoughts require some underlying representation, some theoretical structure that constructs and produces the observable aspects of human thought and actions" (Mandler, 1985, pp. 35-36, 31, my emphasis).

Consider for a moment how much is finessed by this conception. Not only does the schemata contain what would be for Piaget the figurative aspect of knowledge, but also both its own principle of construction (apparently sui generis) and the principle of future construction, i.e., Piaget's operative component of knowledge. That is, everything interesting about cognition is simply presupposed. Thus models of cognitive activity influenced by information-processing - for instance Anderson's production system, or Fischer's skill theory with transformation rules, or Keil's progressive developmental constraints, or Klahr's self-modifying production systems, or Sternberg's componential model (among others) - all valuable for their descriptive power, nonetheless all presuppose the process of construction. And if the process of construction is simply assumed, then the only remaining question becomes a version of Fodor's representational theory of mind, that is, how these various schemata are coordinated with one another.

Certainly the retrieval of mental process from the behaviorist hegemony is a welcome development in psychology, and in a sense, psychology thereby recapituates the philosophical progression from Hume to Kant. But both the Kantian and the Piagetian projects extend far beyond the manipulations by pure reason of schemata, or mental representations. For Kant, the necessity of which knowledge is capable under determination by concepts - the definitional characteristic of positive science - was highly problematic. Such necessity stood in marked contrast to the human experience of freedom, manifested in our self-chosen obedience to moral standards. Moreover, the determination of knowledge under concepts makes inexplicable the possibility of creating new knowledge. Kant was thus forced to introduce a distinction between two domains, that of the phenomena and that of the noumena. The phenomena is the realm subject to determination under concepts, about which we can have positive knowledge; the noumena is the realm of experience subject to freedom, about which we can <u>know</u> nothing in a positive sense, but which we fundamentally <u>are.</u> Insofar as cognitive science takes the Kant of the First Critique as its philosophical progenitor, it reproduces the Kantian antinomy: it can understand the manipulation of mental representations, but only at the cost of isolating cognition from lived-experience.

It is Hegel who sought to overcome this Kantian antinomy through his understanding of phenomenology. For Hegel, phenomenology was not a Kantian reflection on appearance as brought under the determination of concepts, but the moment in which fundamental reality - Kant's noumena - revealed itself to the knower. Hegel thus tried to re-integrate the knower with that which is known, and in a fashion compatible with Piaget in at least a preliminary way, made the process of knowledge the result

of interaction between subject and object. I can do no more here than suggest a comparison of Hegel with Piaget (though a sustained comparison would be well worth the effort).

Briefly, the Piagetian process of equilibration bears intriguing parallels to the Hegelian process of the dialectic, through which the World Idea comes to consciousness of itself. There is the same bidirectional emphasis - on the one hand, toward the world as nature (Hegel) or as empirical abstraction (Piaget); on the other, toward cognitive structuring as spirit (Hegel) or as reflective abstraction (Piaget) - and the same sense of progressive struggle and overcoming (Hegel) or disequilibration (Piaget) through which the Idea (Hegel) or epistemic subject (Piaget) achieves itself as full self-consciousness (Hegel) or the grasp of consciousness (Piaget).

It is as though Piaget, impressed by the self-regulating, closed structures of living systems - a Kantian tendency - was at the same time acutely conscious of the embeddedness of these living systems in a biological milieu. Like Hegel, his thinking was forced beyond the Kantian antinomy, and into a model of progressive and self-sustaining organism-environment interaction. Conversely, cognitive science and its objectivist epistemology has not yet come to terms with the necessity of such a further step. If the process of human cognition is to be adequately approached, one must go not only beyond Hume to Kant, but beyond Kant to Hegel.

III

But Piaget is not entirely guiltless for being mis-understood, and it is to a brief consideration of his own complicity in Piagetian mis-understanding that we may now turn.

As Piaget shares Hegel's insight into dialectic constructivism, so he shares Hegel's tendency for a certain grandiosity of epistemic claim, which may not be warranted. For isntance, consider the Piagetian claim that epistemic development ultimately leads to the "perfect regulations" of logico-mathematical structures (Piaget, 1971b) - formal operations for the individual, science for the collective - much in the way the Hegelian dialectic appears as the inevitable unfolding of the World-Historical Spirit as freedom. It is ironic that what is arguably Piaget's major strength, namely, its sensitivity to what children are capable of epistemically, should in terms of the larger project of genetic epistemology become the norm against which adults and cultures are deemed deficient. As is well known, there is a substantial body of work that tends to disconfirm this claim, among which I would cite the failure of many adolescents and adults to achieve formal operations, and the various ways through which factors such as domain-specific exposure and instruction, and the effects of schooling vs non-schooling, urban vs rural life, and oral-based vs literacy-based culture influence the attainment of Piagetian norms. Taken collectively, I find this evidence against the presumed endpoint of epistemic development, namely, formal operations, to be compelling. The Marxist critique is here useful: Piaget, like Hegel, presumes that a conception of science or truth developed from within a particular cultural ethos is in fact independent of that grounding, and consequently, he overlooks the ideological (i.e., socially determined) functions to which such conceptions are subject. (Of course, in making this criticism of Piaget, I also intend it, and more strongly, against the hegemony of information-processing models of cognition in contemporary cognitive psychology.) It is with a discussion of the ground for this <u>aporia</u> within Piaget's theory that I would

conclude.

In Insights and Illusions of Philosophy (1971a), Piaget draws a distinction between philosophy and science. Philosophy, he claims, is concerned with the coordination of values. Its problems are fundamental and universal, and do not change over time. But since the method of philosophy tends to be speculative and the problems it considers tend to be global, definitive answers to them can never be found. Philosophy may achieve wisdom, even many wisdoms, but it does not, of itself, attain truth, for it has no method through which to acquire positive knowledge.

Science, on the other hand, is a domain of inquiry in which knowledge can be achieved because it does have systematic procedures of experimentation and verification to a clearly delimited problem. Thus, while there may be many wisdoms, there is only one truth. Thus it is as well that as philosophical questions have historically lent themselves to delimitation, and the consequent accumulation of knowledge, they have become increasingly a part of science. This can be seen, for instance, in the development of the physical sciences out of Aristotelian cosmology, or of the social sciences out of 19th century transcendental philosophy. This can also be seen in epistemology, which traditionally an important part of philosophy is seen by Piaget to have increasingly become an empirically-based science.

How does this distinction affect the claims genetic epistemology would make as a discipline of philosophy in the moments of its metamorphosis into a science? What is the 'truth' it would reveal? Is such truth purely epistemic, phenomenal in a Kantian sense, revealing in its structure the reflective activity of the mind in the process of coming to know itself and the world? Certainly one reading which Piaget

offers us would support this view. He has argued that

> Objects certainly exist, and they involve structures which also exist independently of us. But objects and their regularities are known to us only in virtue of operational structures which are applied to them and form the framework of the process of assimilation which enables us to attain them. They are therefore only arrived at by successve approximations, that is, they represent a limit never itself attained. (Piaget, 1972, pp. 90-91)

It would seem to me that such a reading as this is the only one consistent with constructivism, and is compatible with a position of we can call "structural realism," a view associated with the philosophers Bertrand Russell (1948), Grover Maxwell (1970), and Walter Weimer (1975). According to structural realism, what we can know of objects in the world is only those properties and relations revealed as objects interact with each other and interact with us, either directly or as observers. We can never know their intrinsic properties. It is a coherence theory of truth, not a correspondence theory, a theory of how the way in which we know constrains what we can know, not a theory of how the object is rendered transparent despite our limits. The philosophers who have discussed structural realism have tried to support this model by pointing toward the transductive and classificatory features of the nervous system (a view which receives further support as we learn more of computational features of perception). It is also supported by Piaget's stress on operational structuring through reflective abstraction.

So far, so good. But Piaget has also argued that

> Every causal explanation also presupposes the attribution of our operations to objects, and consequently is evidence of an isomorphism between their structures and ours. But this makes so

> much more difficult any assessment of the nature of these objective structures independently of ours, <u>their independent nature</u> becoming in its turn a limit never attained though one in whose existence we are compelled to believe. (Piaget, 1972, p. 91, my emphasis)

What are we to make of this? What could the independent nature of objects be apart from our knowledge of them? By invoking an isomorphism of structure between external objects and our constructions about them, the idea of object-as-limit shifts from epistemology to ontology, and Piaget reproduces the Kantian distinction between noumena and phenomena, with all its attendant problems. "Objects behave rationally and act upon one another according to structures that are isomorphs of our mathematical operations. If they didn't, we wouldn't understand them. It isn't magic, it's the basic tenet of Western science." (Bringuier, p. 60) As a result of such an emphasis, some of Piaget's most sophisticated interpreters - such as Kitchener (1986) - have been led to see him as a correspondence theorist. As Rotman (1977) subtitled his critique, Piaget is viewed as a "Psychologist of the Real." And certainly such a reading, however unsatisfying, is consonant with the larger claims of genetic epistemology insofar as it seeks to unfold not only the psychogenesis of knowledge in the individual, but the sociogenesis of knowledge over historical time.

I will end by adding my voice to the chorus of Piagetian commentators who bemoan his lack of clarity. Here, though, with the deconstructionists, I will identify this imprecision as a necessary and creative <u>aporia</u> at the center of his thought. In other words, Piaget's vision requires both access to a sense of correspondence of our epistemic structures with the world, and a rigorous construction of

these same structures. Only if the former hold can the privilege of logico-mathematical reasoning and formal operations be maintained; and only if the latter holds can Piaget distinguish his epistemology from a simple maturation without construction, such as Fodor's.

I can do no more here than point out this tension in Piaget's thinking. My own view is that a coherentist, and constructivist account of the development of knowledge, emphatically and exclusively epistemic, is the only reading of Piaget compatible with his larger intentions. But the ontologic bias is also present in his thought. The danger of such aporia is that it makes it all the easier for his theory to be mis-interpreted or repudiated by those who, blind to their own assumptions, see only inconsistency rather than creative tension. This is unfortunate, for Piaget's epistemology has the singular strength of adequately modeling the epistemic process. For all its shortcomings, no other contemporary theory in psychology or epistemology does more, and very few do as well.

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